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=> d his

     (FILE 'HOME' ENTERED AT 14:40:36 ON 05 MAR 2004)

     FILE 'STNGUIDE' ENTERED AT 14:40:41 ON 05 MAR 2004

     FILE 'INSPEC' ENTERED AT 14:41:18 ON 05 MAR 2004
L1          14049 SOLAR (A)CELL
L2         126797 FLEXIB#####
L3          17470 NACL
L4             12 DISOLV######
L5             12 DISOLV#########
L6              7 L AND L2 AND L3
L7             14 DHIS

     FILE 'CA' ENTERED AT 14:47:23 ON 05 MAR 2004
L8         683519 SUBSTRATE
L9              4 L1 AND L2 AND L3 AND L8

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=> file ca
COST IN U.S. DOLLARS                                   SINCE FILE     TOTAL
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FULL ESTIMATED COST                                         29.20     29.47

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FILE COVERS 1907 - 4 Mar 2004 VOL 140 ISS 11
FILE LAST UPDATED: 4 Mar 2004  (20040304/ED)

  This file contains CAS Registry Numbers for easy and accurate
  substance identification.


=> substrate
L8      683519 SUBSTRATE

=> l1 and l2 and l3 and l8
        115654 SOLAR
       1692128 CELL
         33563 SOLAR (A)CELL
        112567 FLEXIB#####
        252237 NACL
L9           4 L1 AND L2 AND L3 AND L8

=> d l9 1-4 all

L9   ANSWER 1 OF 4  CA  COPYRIGHT 2004 ACS on STN
AN   137:127459  CA
ED   Entered STN:  22 Aug 2002
TI   Low temperature growth of CIGS thin films for flexible solar
     cells
AU   Rudmann, D.; Haug, F.-J.; Kaelin, M.; Zogg, H.; Tiwari, A. N.; Bilger, G.
CS   Laboratory for Solid State Physics, Thin Film Physics Group, ETH Zurich,
     Technopark, Zurich, CH-8005, Switz.
SO   Materials Research Society Symposium Proceedings (2001), 668(II-VI
     Compound Semiconductor Photovoltaic Materials), H3.8/1-H3.8/6
     CODEN: MRSPDH; ISSN: 0272-9172
PB   Materials Research Society
DT   Journal
LA   English
CC   52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
AB   Low substrate temps. have to be used for polymer substrates.
     Therefore, using soda lime glass (SLG) substrates with and without an
     alkali barrier (Al2O3), a three-step CIGS coevaporation process for a
     substrate temperature of 450° was developed and compared to film
     deposition with constant evaporation rates.  The three-step process enhanced
     grain nucleation.  An efficiency of 14.0% was achieved with this process
     for solar cells on SLG.  Since polymers in general do not contain Na, a
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way of Na addition to the absorber is needed. NaF coevaporation can be used to control the Na content in CIGS. Also, incorporation of Na in CIGS by diffusion from a **NaCl** layer through a polyimide is demonstrated. With such SLG/**NaCl**/polyimide structures, **flexible** solar cells can be obtained using a lift-off process. A cell efficiency of 11.6% (0.99 cm2 area) has been achieved.

ST **flexible solar cell** copper indium gallium selenide thin film; soda lime **substrate** copper indium gallium selenide film

IT Vapor deposition process
(chemical, of CIGS thin films; low-temperature growth of copper indium gallium selenide thin films on soda lime glass **substrate** for **flexible** solar cells)

IT Solar cells
(low-temperature growth of copper indium gallium selenide thin films on soda lime glass **substrate** for **flexible** solar cells)

IT Polyimides, uses
Soda-lime glasses
RL: CPS (Chemical process); DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(**substrate**; low-temperature growth of copper indium gallium selenide thin films on soda lime glass **substrate** for **flexible** solar cells)

IT 1344-28-1, Aluminum oxide (Al2O3), uses
RL: CPS (Chemical process); DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(alkali barrier; low-temperature growth of copper indium gallium selenide thin films on soda lime glass **substrate** for **flexible** solar cells)

IT 7681-49-4, Sodium fluoride, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(sodium source; low-temperature growth of copper indium gallium selenide thin films on soda lime glass **substrate** for **flexible** solar cells)

IT 7647-14-5, Sodium chloride, uses
RL: CPS (Chemical process); DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(substrates containing; low-temperature growth of copper indium gallium selenide thin films on soda lime glass **substrate** for **flexible** solar cells)

IT 111419-77-3, Copper gallium indium selenide (Cu(Ga,In)Se2)
RL: CPS (Chemical process); DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(thin films; low-temperature growth of copper indium gallium selenide thin films on soda lime glass **substrate** for **flexible** solar cells)

RE.CNT 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE
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(2) Bodegard, M; Thin Solid Films 2000, V361, P9
(3) Contreras, M; 26th IEEE PVSC 1997
(4) Granath, K; Sol En Mat & Solar Cells 2000, V60, P279 CA
(5) Hartmann, M; Proc 28th IEEE PVSC 2000
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(9) Nakada, T; Proc 14th Europ PVSEC 1997, P2143
(10) Ruckh, M; Proc 1st WCPEC 1994, P156 CA
(11) Rudmann, D; Proc 16th Europ PVSEC 2000, P298 CA
(12) Tiwari, A; Progr PV: Res & Appl 1999, V7, P393 CA
(13) Tuttle, J; Proc 28th IEEE PVSC 2000

L9 ANSWER 2 OF 4 CA
AN 135:259727 CA
ED Entered STN: 18 Oct 2001
TI Development of **flexible** Cu(In,Ga)Se2 solar cells on polymers with lift-off processes
AU Rudmann, D.; Haug, F.-J.; Krejci, M.; Zogg, H.; Tiwari, A. N.
CS Institute of Quantum Electronics, Thin Film Physics Group, ETH Zurich, Zurich, CH-8005, Switz.
SO European Photovoltaic Solar Energy Conference, Proceedings of the International Conference, 16th, Glasgow, United Kingdom, May 1-5, 2000 (2000), Volume 1, 298-301. Editor(s): Scheer, Hermann. Publisher: James & James (Science Publishers) Ltd., London, UK.
CODEN: 69BOEK
DT Conference
LA English
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
AB The choice of an appropriate **substrate** is very important for the development of lightwt. and **flexible** Cu(In,Ga)Se2 (CIGS) solar cells. Because of high CIGS deposition temps. the choice of polymer substrates is restricted to polyimides. We have developed a process where high temperature stable polyimides with tailored thermophys. properties can be used. Using a **NaCl** buffer layer and a lift-off process 12.8% efficiency CIGS solar cells have been grown on a 20 μm thin polyimide film. In another approach the CIGS cells are grown at >500° on a glass **substrate** covered with a buffer layer. A transparent polymer is applied after growth of the **solar cell** and the buffer layer is subsequently dissolved. Solar cells with an efficiency of 8% have been obtained.
ST copper gallium indium selenide **flexible solar cell**; polyimide copper gallium indium selenide **flexible solar cell**
IT Solar cells
(development of **flexible** copper gallium indium selenide solar cells on polymers using lift-off processes)
IT Polyimides, uses
RL: NUU (Other use, unclassified); USES (Uses)
(development of **flexible** copper gallium indium selenide solar cells on polymers using lift-off processes)
IT 7647-14-5, Sodium chloride, uses
RL: NUU (Other use, unclassified); USES (Uses)
(buffer layer; in development of **flexible** copper gallium indium selenide solar cells on polymers using lift-off processes)
IT 111419-77-3, Copper gallium indium selenide [Cu(Ga,In)Se2]
RL: DEV (Device component use); USES (Uses)
(development of **flexible** copper gallium indium selenide solar cells on polymers using lift-off processes)
RE.CNT 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR THIS RECORD
RE
(1) Basol, B; 25th IEEE Photovol Spec Conf 1988-1996, P157
(2) Burgess, R; Proc 20th IEEE Photovol Spec Conf 1988, P909 CA
(3) Contreras, M; Progress in Photovoltaics 1999, V7, P311 CA
(4) Gay, C; 17th IEEE Photovol Spec Conf 1984-1988, P151 CA
(5) Gillespie, T; Solar Energy Materials and Solar Cells 1999, V59, P27 CA
(6) Hagiwara, Y; Technical Digest of the International PVSEC-11 1999, P83
(7) Negami, T; Technical Digest of the International PVSEC-11 1999, P993
(8) Schock, H; Proc 14th European Photovoltaic Solar Energy Conference 1997, P2000
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Energy Conversion 1998, P3586
(10) Tiwari, A; Progress in Photovoltaics: Research and Applications 1999, V7, P393 CA
(11) Wiedeman, S; Proc NCPV Program Review Meeting 1999, P17 CA

L9 ANSWER 3 OF 4 CA COPYRIGHT 2004 ACS on STN
AN 134:88850 CA
ED Entered STN: 01 Feb 2001
TI **Flexible** thin-layer **solar cell**
IN Tiwari, Ayodhya N.; Krejci, Martin; Haug, Franz Josef; Zogg, Hans
PA Eidgenossische Technische Hochschule (ETH), Switz.
SO PCT Int. Appl., 19 pp.
CODEN: PIXXD2
DT Patent
LA German
IC ICM H01L031-18
ICS H01L031-032; H01L031-0392
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	WO 2001004964	A1	20010118	WO 2000-CH379	20000712

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	EP 1200995	A1	20020502	EP 2000-940105	20000712

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	JP 2003504877	T2	20030204	JP 2001-509094	20000712
PRAI	CH 1999-1287	A	19990713		
	WO 2000-CH379	W	20000712		

AB A method is disclosed for producing a **flexible** thin-layer **solar cell**. An intermediate layer, known as a sacrificial layer, for example **NaCl**, is applied to a rigid **substrate** and a carrier layer, for example, a polyimide is deposited thereon. Addnl. layers are then deposited onto the support layer, for example, Mo, a CuInxGaySzSeu absorber with x, y, z, u ≥0, a CdS-ZnO window layer and a transparent front contact, the structuring of the cells is completed and they are optionally provided with a coating. The **solar cell** structure is separated from the rigid **substrate** by the dissoln. of the sacrificial layer, whereby the resultant **solar cell** becomes **flexible**. The invention relates to **flexible** solar cells produced by this method which have typical thicknesses of 25 μm with approx. 13% efficiency. Large-surface cells can be used for energy production both on earth and in space, while small-surface cells can be used for powering electronic goods, such as for example, pocket calculators and smart cards.
ST **solar cell flexible**
IT Solar cells
(fabrication and performance of **flexible** thin-layer **solar cell**)
IT Polyimides, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(fabrication and performance of **flexible** thin-layer **solar cell**)
IT Alkaline earth fluorides
RL: TEM (Technical or engineered material use); USES (Uses)

(fluorides, sacrificial layer; fabrication and performance of **flexible** thin-layer **solar cell**)

IT Alkali metal halides, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(sacrificial layer; fabrication and performance of **flexible** thin-layer **solar cell**)

IT 1306-23-6, Cadmium sulfide, uses 1314-13-2, Zinc oxide, uses 7439-98-7, Molybdenum, uses 176655-87-1, Copper gallium indium selenide sulfide
RL: DEV (Device component use); USES (Uses)
(fabrication and performance of **flexible** thin-layer **solar cell**)

IT 7447-40-7, Potassium chloride, uses 7647-14-5, Sodium chloride, uses 7681-49-4, Sodium fluoride, uses 7787-32-8, Barium fluoride
RL: TEM (Technical or engineered material use); USES (Uses)
(sacrificial layer; fabrication and performance of **flexible** thin-layer **solar cell**)

RE.CNT 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE
(1) Anon; PATENT ABSTRACTS OF JAPAN 1988, V012(348), PE-659
(2) Anon; PATENT ABSTRACTS OF JAPAN 1989, V013(346), PE-798
(3) Basol, B; "COPPER INDIUM DISELENIDE THIN FILM SOLAR CELLS FABRICATED ON FLEXIBLE FOIL SUBSTRATES", SOLAR ENERGY MATERIALS AND SOLAR CELLS 1993, V29(2), P163 CA
(4) Basol, B; SOLAR ENERGY MATERIALS AND SOLAR CELLS 1996, V43(1), P93 CA
(5) Canon Kk; EP 0851513 A 1998 CA
(6) Kawanishi, Y; US 5232860 A 1993 CA
(7) Landis, G; SOLAR CELLS 1990, V29(2 / 03), P257
(8) Matsushita Electric Ind Co Ltd; JP 63107073 A 1988
(9) Sanyo Electric Co Ltd; JP 01105581 A 1989
(10) Univ Delaware; DE 2447066 A 1975 CA

L9 ANSWER 4 OF 4 CA COPYRIGHT 2004 ACS on STN

AN 132:13850 CA

ED Entered STN: 01 Jan 2000

TI 12.8% efficiency Cu(In,Ga)Se2 **solar cell** on a **flexible** polymer sheet

AU Tiwari, A. N.; Krejci, M.; Haug, F.-J.; Zogg, H.

CS Thin Film Physics Group, Institute of Quantum Electronics, ETH (Swiss Federal Institute of Technology) Zurich, Zurich, CH-8005, Switz.

SO Progress in Photovoltaics (1999), 7(5), 393-397
CODEN: PPHOED; ISSN: 1062-7995

PB John Wiley & Sons Ltd.

DT Journal

LA English

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

AB A lift-off process has been developed to obtain Cu(In,Ga)Se2 solar cells on **flexible** polymer sheets. The absorber layer is grown by a co-evaporation method on a polyimide layer, which is spin coated on a **NaCl**-covered glass **substrate**. The **NaCl** intermediate layer can provide Na to the Cu(In,Ga)Se2 layer during deposition. After the complete processing of the cells, the **NaCl** buffer layer is dissolved to sep. the glass **substrate** from the ZnO/CdS/Cu(In,Ga)Se2/Mo/polyimide stack. A record conversion efficiency of 12.8% (total area) under air-mass 1.5 illumination was independently measured. Such high-efficiency solar cells on lightwt. and **flexible** substrates are needed for novel terrestrial and space applications.

ST copper gallium indium selenide **solar cell** polyimide sheet

IT Solar cells
(fabrication of 12.8% efficient copper gallium indium selenide solar cells on **flexible** polymer sheet)

IT Polyimides, uses

RL: DEV (Device component use); USES (Uses)
(fabrication of 12.8% efficient copper gallium indium selenide solar cells on **flexible** polymer sheet)

IT 111419-77-3, Copper gallium indium selenide [Cu(Ga,In)Se2]
RL: DEV (Device component use); USES (Uses)
(fabrication of 12.8% efficient copper gallium indium selenide solar cells on **flexible** polymer sheet)

RE.CNT 10 THERE ARE 10 CITED REFERENCES AVAILABLE FOR THIS RECORD

RE

(1) Basol, B; 25th IEEE Photovoltaics Special Conference 1996, P157
(2) Burgess, R; Proceedings of the 20th IEEE Photovoltaics Special Conference 1988, P909 CA
(3) Contreras, M; Proceedings of the 14th European Photovoltaic Solar Energy Conference 1997, P2354
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(6) Granath, K; Proceedings of the 14th European Photovoltaic Solar Energy Conference 1997, P1278
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(8) Schock, H; Proceedings of the 14th European Photovoltaic Solar Energy Conference 1997, P2000
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Solar Energy Materials and Solar Cells
Volume 43, Issue 1 , 15 August 1996, Pages 93-98

doi:10.1016/0927-0248(95)00171-9 Cite or link using doi

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- Abstract + References
- PDF (318 K)

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Paper

Flexible and light weight copper indium diselenide solar cells on polyimide substrates

Bülent M. Başol[a], , Vijay K. Kapur[a], Craig R. Leidholm[a], Arvind Halani[a] and Kristen Gledhill[b]

[a] International Solar Electric Technology (ISET), 8635 Aviation Blvd., Inglewood, CA 90301, USA
[b] Phillips Laboratory, Kirtland Air Force Base, Albuquerque, NM 87117, USA

Received 20 July 1995. Available online 15 February 1999.

Abstract

Thin film flexible $CuInSe_2$ (CIS) solar cells have been fabricated for the first time on light-weight polymeric substrates. Evaporated Cu---In alloy precursors were selenized in H_2Se atmosphere at around 400°C to grow the CIS absorber layers. Low temperature techniques which are compatible with the polymeric substrates were used to deposit the window layers of CdS and ZnO. The demonstrated active area conversion efficiency of 9.3% makes this light-weight device very attractive for many terrestrial and space power generation applications where high specific power and mechanical flexibility are needed.

Author Keywords: Copper indium selenide; Flexible solar cell; Lightweight solar cell; Space solar cell

Corresponding author.

Solar Energy Materials and Solar Cells
Volume 43, Issue 1 , 15 August 1996, Pages 93-98

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☐	L32	l30 same substrate	2472
☐	L31	l7 and l30	230
☐	L30	l3 same l27	115224
☐	L29	L28 and l3	142
☐	L28	L27 and l7 and l10	2405
☐	L27	water	3041922
☐	L26	l7 and l10 and l14	4
☐	L25	l10 and l21	59
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☐	L22	2002022290	3
☐	L21	l7 and l19	156
☐	L20	l2 and l19	0
☐	L19	438/455-465.ccls.	3943
☐	L18	l2 and l7	64
☐	L17	l2 same l14	1
☐	L16	l2 near20 l14	1
☐	L15	l2 near20 l14L14	0
☐	L14	disolv$5	2095
☐	L13	l9 not l11	218
☐	L12	l11 not l9	0
☐	L11	L10 and l9	85
☐	L10	flex$5	1262702
☐	L9	l6 and l7	303
☐	L8	L7	51781
☐	L7	(solar adj cell)or photovolta$4 or photo-volt$5	51781
☐	L6	l3 same l4	142801
☐	L5	l3 same l4	142801
☐	L4	solu$5	4233261
☐	L3	l1 or l2	230779

☐	L2	(barium adj fluoride) or baf?.sub$	2737
☐	L1	(sodium adj chloride)or nacl	228421

END OF SEARCH HISTORY